CLAIMS:

1. A gradient coil system for magnetic resonance imaging systems, comprising at least two X primary coil-like elements, at least two Y primary coil-like elements and one Z primary coil-like element providing a modular gradient coil system, wherein the at least two X primary coil-like elements have mutually different linearity volumes by themselves or in combination with each other, the at least two Y primary coil-like elements have mutually different linearity volumes by themselves or in combination with each other, and the one Z primary coil-like element is placed between the X primary coil-like elements and the Y primary coil-like elements.

2. A gradient coil system according to claim 1, characterized in that the one Z primary coil-like element is placed between the X primary coil-like elements and the Y primary coil-like elements in such a way that at both sides of the Z primary coil-like element there is arranged at least one X primary coil-like element and at least one Y primary coil-like element.

3. A gradient coil system according to claim 2, characterized in that the one Z primary coil-like element (Z_{PC}) is placed between the two X primary coil-like elements and the two Y primary coil-like elements in such a way that at one side of the Z primary coil-like element (Z_{PC}) there is arranged a first X primary coil-like element ($X1_{PC}$) and a first Y primary coil-like element ($Y1_{PC}$), and that at the other side of the Z primary coil-like element (Z_{PC}) there is arranged a second X primary coil-like element ($X2_{PC}$) and a second Y primary coil-like element ($Y2_{PC}$).

4. A gradient coil system according to claim 1, characterized by at least two X shield coil-like elements, at least two Y shield coil-like elements and one Z shield coil-like element, wherein the one Z shield coil-like element is placed between the X shield coil-like elements and the Y shield coil-like elements.

5. A gradient coil system according to claim 4, characterized in that the one Z shield coil-like element is placed between the X shield coil-like elements and the Y shield coil-like elements in such a way that at both sides of the Z shield coil-like element there is arranged at least one X shield coil-like element and at least one Y shield coil-like element.

6. A gradient coil system according to claim 5, characterized in that the one Z shield coil-like element (Z_{SC}) is placed between the two X shield coil-like elements and the two Y shield coil-like elements in such a way that at one side of the Z shield coil-like element (Z_{SC}) there is arranged a first X shield coil-like element ($X1_{SC}$) and a first Y shield coil-like element ($Y1_{SC}$), and at the other side of the Z shield coil-like element (Z_{SC}) there is arranged a second X shield coil-like element ($X2_{SC}$) and a second Y shield coil-like element ($Y2_{SC}$).

7. A gradient coil system according to claim 1, characterized in that the one Z primary coil-like element (Z_{PC}) is made from hollow conductors, and that the one Z primary coil-like element (Z_{PC}) is directly cooled by a cooling fluid flowing through said hollow conductors.

8. A gradient coil system according to claim 7, characterized in that the two X primary coil-like elements ($X1_{PC}$, $X2_{PC}$) and the two Y primary coil-like elements ($Y1_{PC}$, $Y2_{PC}$) positioned at both sides of the one Z primary coil-like element (Z_{PC}) are indirectly cooled by said directly cooled Z primary coil-like element (Z_{PC}).

9. A gradient coil system according to claim 4, characterized in that the one Z shield coil-like element (Z_{SC}) is made from hollow conductors, and that the one Z shield coil-like element (Z_{SC}) is directly cooled by a cooling fluid flowing through said hollow conductors.

10. A gradient coil system according to claim 9, characterized in that the two X shield coil-like elements ($X1_{SC}$, $X2_{SC}$) and the two Y shield coil-like elements ($Y1_{SC}$, $Y2_{SC}$) positioned around the one Z shield coil-like element (Z_{SC}) are indirectly cooled by the directly cooled Z shield coil-like element (Z_{SC}).

11. A gradient coil system according to claim 4, characterized in that the two X primary coil-like elements ($X1_{PC}$, $X2_{PC}$), the two Y primary coil-like elements ($Y1_{PC}$, $Y2_{PC}$)

and the one Z primary coil-like element (Z_{PC}) provide an inner coil arrangement, that the two X shield coil-like elements ($X1_{SC}$, $X2_{SC}$), the two Y shield coil-like elements ($Y1_{SC}$, $Y2_{SC}$) and the one Z shield coil-like element (Z_{SC}) provide an outer coil arrangement, and that a layer (17) comprising epoxy with filler material and/or a GRP tube layer (18) are positioned between the inner coil arrangement and the outer coil arrangement.

12. A gradient coil system according to claim 11, characterized in that the layer (17) is positioned adjacent the inner coil arrangement, and that the GRP tube layer (18) is positioned adjacent the outer coil arrangement.

13. A gradient coil system according to claims 3, 6 and 11, characterized in that the second X primary coil-like element ($X2_{PC}$) and the second Y primary coil-like element ($Y2_{PC}$) are positioned between the one Z primary coil-like element (Z_{PC}) and the epoxy or glass layer, and that the second X shield coil-like element ($X2_{SC}$) and the second Y shield coil-like element ($Y2_{SC}$) are positioned between the one Z shield coil-like element (Z_{SC}) and the GRP tube.

14. A magnetic resonance imaging system, comprising a main magnet system, a gradient coil system, a RF system and a signal processing system, characterized in that the gradient coil system is a gradient coil system according to any one of the preceding claims 1 to 13.